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IS 9087 (2000): Aircraft - 100° Countersunk Aluminium Alloy Rivets [TED 14: Aircraft and Space Vehicles]

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वायुयान — 100° काउंटरसंक मिश्रित ऐल्युमिनियम की रिवटें — विशिष्टि

(पहला पुनरीक्षण)

Indian Standard

AIRCRAFT — 100° COUNTERSUNK ALUMINIUM ALLOY RIVETS — SPECIFICATION

(First Revision)

ICS 49 025 20

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

September 2000 **Price Group 4**

Aircraft and Space Vehicles Sectional Committee, TED 14

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Aircraft and Space Vehicles Sectional Committee had been approved by the Transport Engineering Division Council

This standard was originally published in 1979 As a result of experience gained by the users, revision was taken up to include more details of material grade

This standard is one of the series of Indian Standards on rivets for aircraft use The dimensions specified in this standard conform to ISO 3230 1998 'Aerospace Rivets, solid 100° normal countersunk with dome, metallic material, with or without surface treatment — Dimensions', issued by the International Organization for Standardization (ISO)

The committee responsible for preparation of this standard is given in Annex A

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 1960 'Rules for rounding off numerical values (*revised*)' The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard

AMENDMENT NO. 1 JANUARY 2003
TO
IS 9087 : 2000 AIRCRAFT — 100° COUNTERSUNK ALUMINIUM ALLOY RIVETS — SPECIFICATION

(First Revision)

(Page 1, clause 3.1) — Substitute the following for the existing:

3.1 Rivets shall be made from anyone of the five aluminium alloys specified in respective Indian Standards as follows:

Alloy No.	*IS No.*
1	8513
2	8937
3	8514
4	8936
5	8938

(TED 14)

Reprography Unit, BIS, New Delhi, India

Indian Standard
AIRCRAFT — 100° COUNTERSUNK ALUMINIUM ALLOY RIVETS — SPECIFICATION
(First Revision)

1 SCOPE

This standard covers material, dimensions and requirements for 100° countersunk head aluminium alloy rivets for use in aircraft.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1868 : 1996	Anodic coatings on aluminium and its alloys (*third revision*)
8513 : 1977	Aluminium alloy wire for cold forged rivets for aircraft purposes (Alloy 55000)
8514 : 1977	Aluminium alloy wire for cold forged rivets for aircraft purposes (Alloy 24530)
8936 : 1978	Aluminium alloy for wire for cold forged rivets for aircraft purposes (Alloy 24350)
8937 : 1978	Aluminium alloy wire for cold forged rivets for aircraft purposes (Alloy 22500)
8938 : 1978	Aluminium alloy wire for cold forged rivets for aircraft purposes (Alloy 24345)
9089 : 1996	Aircraft — Aluminium and wrought aluminium rivets — General requirements (*first revision*)

3 MATERIALS

3.1 The chemical composition of the alloys shall be as given in IS 8513, IS 8514, IS 8936, IS 8937 or IS 8938.

3.2 The condition of supply, heat treatment and mechanical properties of wire used for manufacture of rivets shall be as follows:

Alloy No.	*Condition as Delivered to Rivet Maker*	*Heat Treatment to be Given to Tensile Test Sample*	*Minimum Tensile Strength of Test Sample*, MPa	*Minimum Shear Strength*, MPa
1	Annealed	None	265	160
2	Annealed and cold-drawn to secure a reduction on cross-sectional area of not less than 20 percent nor more than 40 percent	Solution treated at 495 ± 5°C quenched in water below 40°C and aged for not less than 4 days at room temperature	290	185
3	Annealed and cold-drawn to secure a reduction of cross-sectional area of not less than 20 percent nor more than 40 percent	Solution treated at 495 ± 5°C quenched in water below 40°C and aged at room temperature for not less than 4 days	390	265
4	do	Solution treated at 510 ± 5°C and quenched in water below 40°C and aged at temperature of 75 ± 5°C for 24 h	355	245
5	do	Solution treated at 495 ± 5°C and quenched in water at a temperature below 40°C and aged at room temperature for not less than 48 h	400	235

3.3 Heat Treatment of Rivets by Rivet Manufacturer

Alloy No	*Heat Treatment of Rivets*	*Remarks*
1	None	—
2	Solution treated at a temperature of 495 ± 5°C and quenched in water at a temperature not exceeding 40°C. Aged at room temperature for not less than 4 days	—
3	do	—
4	Solution treated at a temperature of 510 ± 5°C and quenched in water at a temperature not exceeding 40°C. Aged at temperature 75 ± 5°C for 24 h	No refrigeration is necessary before rivetting
5	Solution treated at a temperature of 495 ± 5°C and quenched in water at a temperature not exceeding 40°C. Aged at room temperature for not less than 48 h	Rivets commence to age-harden immediately when kept at atmospheric temperatures after quenching Ageing may be delayed by storing the rivets at low temperatures after quenching and they may be expected to remain in a condition suitable for closing for a period depending on the storage temperature as shown below *Temperature* | *Maximum Storage Period* –0 to –5°C | 45 h –5.6 to –20°C | 150 h

4 DIMENSIONS

4.1 Dimensions and tolerances for diameter codes as recommended by ISO shall be as given in Table 1. These dimensions and tolerances are applicable after the surface treatment.

4.2 Length combination shall be as given in Table 2.

4.3 Dimensions and tolerances for diameter codes other than ISO are given in Table 3. These dimensions and tolerances are applicable after the surface treatment.

5 FINISH AND IDENTIFICATION SYMBOLS

The finish and identification symbols for the rivets are shown on page 3. The rivets shall be marked on the head with the symbols. The symbols for Alloys No. 1, 3 and 5 shall be embossed, having a height of approximately 0.3 mm. The indented point for Alloy No. 2 shall have a depth of approximately 0.3 mm.

6 GENERAL REQUIREMENTS

Unless specified otherwise, the general requirements for rivets shall conform to IS 9089.

7 DESIGNATION

Aluminium alloy rivets shall be designated by its name, rivet diameter, rivet length, alloy number and number of this standard.

Example

A 100° countersunk head rivet of diameter code 060 (6 mm), length 20 mm, made of Alloy No. 3 and conforming to this standard shall be designated as

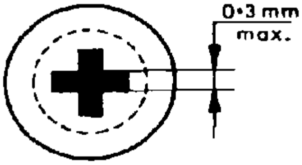
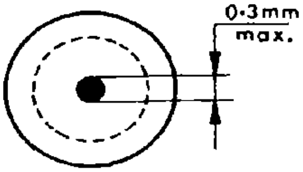
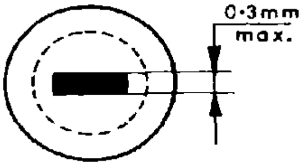
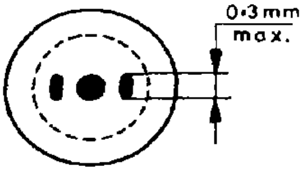
100° Countersunk head rivet 060 × 20 - 3 — IS 9087

8 INSPECTION

The inspection is by quality control methods designed to ensure that the manufacturing process is stable and that the rivets meet the requirement of the specification. For sampling and inspection plan refer Table 1 of IS 9089.

9 FREEDOM FROM DEFECTS

The rivets shall be free from harmful defects. The rivets may be rejected for faults in, or revealed in manufacture, although they have been made from material passed previously for chemical composition and mechanical properties.

Alloy No	Finish		Identification Symbol	
	Treatment	Colour		
1	Anodic	Green		Embossed
2	Anodic	Voiled		Indented
3	Anodic	Blue		Embossed
4	Anodic	Grey		No Marking
5	Anodic	Plain		Embossed

NOTE — For anodic coating *see* IS 1868

10 MARKING

10.1 Packages shall be legibly and indelibly marked with the following

- a) Manufacturer's name or trade-mark if any,
- b) Rivet designation
- c) Quantity,
- d) Month/year of manufacture and
- e) Inspector's stamp

10.2 Rivets may also be marked with the Standard Mark

10.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act* 1986 and the Rules and Regulations made thereunder The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards

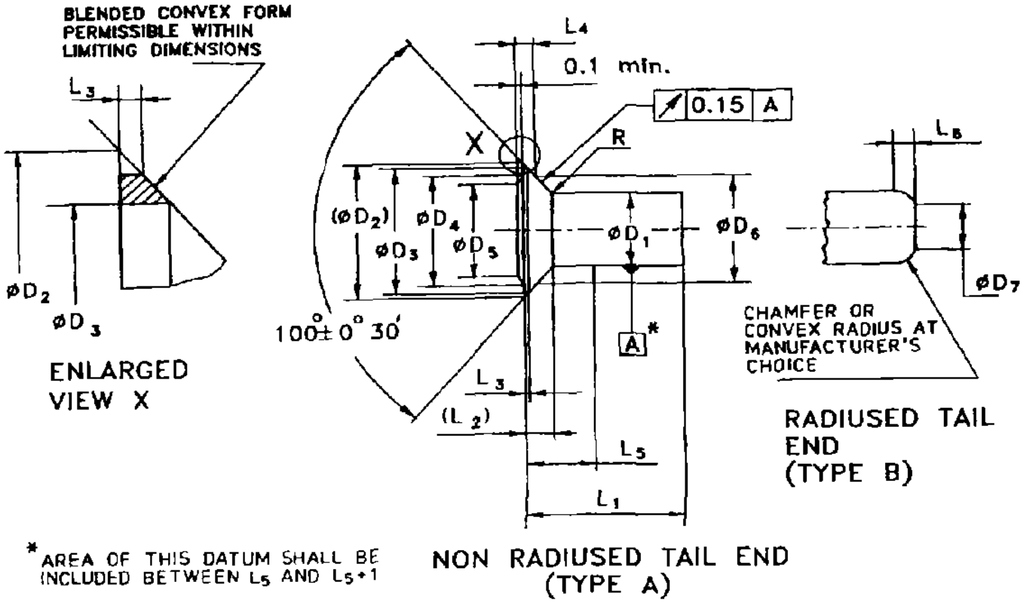
11 PACKING

11.1 The rivets shall be packed as agreed to between the purchaser and the supplier Each unit of packing shall contain rivets of only one form, size manufactured from one batch of material and, as far as possible, inspected together

11.2 The packing shall be capable of protecting the rivets from damage during transit and storage by usual means

Table 1 Dimensions and Tolerances (ISO Codes)

(*Clause* 4.1)


BLENDED CONVEX FORM PERMISSIBLE WITHIN LIMITING DIMENSIONS
L3
øD2
øD3
ENLARGED VIEW X
X
100° ± 0° 30′
L4
0.1 min.
0.15 A
R
(øD2)
øD4
øD3
øD5
øD1
øD6
A*
L3
(L2)
L5
L1
L6
øD7
CHAMFER OR CONVEX RADIUS AT MANUFACTURER'S CHOICE
RADIUSED TAIL END (TYPE B)
*AREA OF THIS DATUM SHALL BE INCLUDED BETWEEN L5 AND L5+1
NON RADIUSED TAIL END (TYPE A)

Diameter Code	D_1	D_2	D_3	D_4		D_5		D_6	D_7		L_2	L_3	L_4	L_5	L_6		R
	d11		*Min*	*Max*	*Min*	*Max*	*Min*		*Max*	*Min*		*Min*	0 0.08		*Max*	*Min*	± 0.08
016	1.6	3	2.7	2.7	2.2	2.2	1.6	2.25	—	—	0.59	0.03	0.41	2	—	—	0.15
020	2	3.7	3.3	3.3	2.6	2.6	2.0	2.89	—	—	0.72	0.04	0.44	2.2	—	—	
025	2.5	4.65	4.15	4.15	3.3	3.3	2.5	3.86	2.0	1.7	0.91	0.05	0.43	2.4	0.8	0.5	
030	3	5.55	4.95	4.95	4.0	4	3	4.5	2.4	2.1	1.07	0.06	0.54	2.5	0.9	0.6	
035	3.5	6.5	5.8	5.8	4.6	4.6	3.5	5.14	2.8	2.45	1.26	0.07	0.67	2.8	1.05	0.7	0.25
040	4	7.4	6.6	6.6	5.3	5.3	4.0	5.78	3.2	2.8	1.43	0.08	0.78	3	1.2	0.8	
050	5	9.25	8.25	8.25	6.6	6.6	5.0	7.71	4.0	3.5	1.8		0.85	3.8	1.5	1.0	
060	6	11.1	9.9	9.9	8.0	8	6	9	4.8	4.2	2.15		0.98	4.1	1.8	1.2	
080	8	14.8	13.6	13.6	10.8	10.8	8.0	12.21	6.4	5.6	2.87	0.1	1.19	4.8	2.4	1.6	
100	10	18.5	17.3	17.3	13.6	13.6	10.0	15.43	8	7	3.59		1.39	5.5	3	2	

NOTES

1 Over length (l_5 - l_2), D_1 *Max* may increase by 0.03

2 For length l_1 *see* Table 3

Table 2 Lengths L_1 for Rivets in Aluminium and Aluminium Alloys

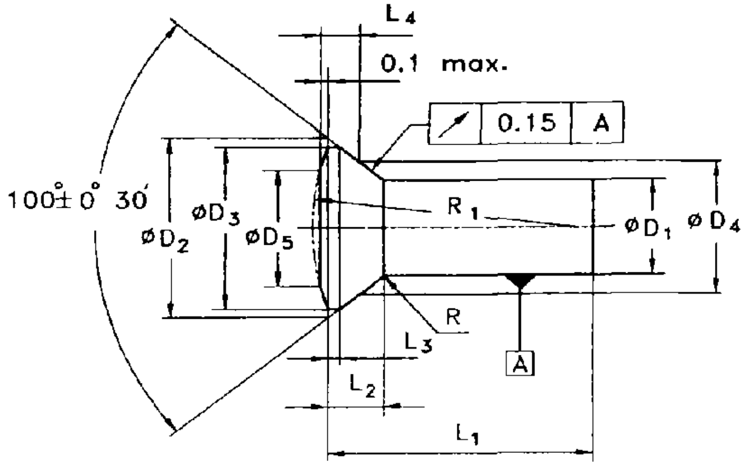
(*Clause* 4 2)

Diameter Code		016	020	025		030		035		040		050		060		080		100	
Length		Type of Tail End[1]																	
Code	L, $^{+0.5}_{0}$	A	A	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
003	3	X	X																
004	4	X	X	X	X	X	X	X	X										
005	5	X	X	X	X	X	X	X	X										
006	6	X	X	X	X	X	X	X	X	X	X								
007	7	X	X	X	X	X	X	X	X	X	X								
008	8	X	X	X	X	X	X	X	X	X	X	X	X						
009	9	X	X	X	X	X	X	X	X	X	X	X	X						
010	10	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
011	11	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
012	12	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
013	13	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
014	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
015	15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
016	16	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
017	17		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
018	18		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
019	19		X	X		X		X	X	X	X	X	X	X	X	X	X	X	X
020	20		X	X		X		X	X	X	X	X	X	X	X	X	X	X	X
022	22		X	X		X		X		X	X	X	X	X	X	X	X	X	X
024	24		X	X		X		X		X	X	X	X	X	X	X	X	X	X
026	26			X		X		X		X		X	X	X	X	X	X	X	X
028	28			X		X		X		X		X	X	X	X	X	X	X	X
030	30			X		X		X		X		X		X	X	X	X	X	X
032	32			X		X		X		X		X		X	X	X	X	X	X
035	35			X		X		X		X		X		X		X	X	X	X
040	40					X		X		X		X		X		X		X	
045	45							X		X		X		X		X		X	
050	50									X		X		X		X		X	
055	55											X		X		X		X	
060	60											X		X		X		X	

[1] *See* Figure under Table 1

Table 3 Dimensions and Tolerances (Other than ISO Codes)

(*Clause* 4.3)



Dia Code	D_1	D_2	D_3 Min	D_4	D_5 Min	L_2	L_3 Min	L_4	R	R_1
024	2.4	4.63 4.46	4.17	3.84	2.4	0.91	0.20	0.44 0.36	0.25 0.10	8.0
026	2.6	4.98 4.80	4.46	4.22	2.6	1.0	0.22	0.46 0.38	0.25 0.10	10.0
032	3.2	5.80 5.63	5.28	4.88	3.2	1.07	0.23	0.49 0.41	0.25 0.10	12.0
048	4.8	9.08 8.85	8.36	7.57	4.8	1.78	0.30	0.74 0.64	0.38 0.20	30.0
056	5.6	10.64 10.41	9.80	8.89	5.6	2.11	0.36	0.84 0.71	0.38 0.20	40.0
064	6.4	12.20 11.97	11.30	10.19	6.4	2.41	0.38	0.95 0.85	0.38 0.20	50.0

NOTES

1 Radius R and R_1 are optional

2 Length L_1 as required or selected from Table 2

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Aircraft and Space Vehicles Sectional Committee, TED 14

Chairman	*Representing*
SHRI M V SUNDARAM	Directorate General of Aeronautical Quality Assurance (DGAQA) New Delhi
Members	
SHRI R N SHARAMA (*Alternate* to Shri M V Sundaram)	
SHRI B K JOSHI	Directorate General of Civil Aviation, New Delhi
SHRI N S MUNDEY (*Alternate*)	
SHRI RAMAN CHOPRA	Indian Airlines New Delhi
PROF T S RMAMURTHY	Indian Institute of Science, Bangalore
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SHRI J P SINGH	National Aeronautical Laboratory (CSIR) Bangalore
DR T S BALASUBRAMANIUM (*Alternate*)	
SHRI A VENKOBA RAO	Hindustan Aeronautics Ltd (Aircraft Design Bureau), Bangalore
SHRI PERDUMAN SINGH	Centre for Military Airworthiness and Certification (CEMILAC) Bangalore
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SHRI S GOVINDARAJAN	Bharat Dynamics Ltd, Hyderabad
SHRI R N DESAI (*Alternate*)	
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SHRI S RAMAKRISHNAN (*Alternate*)	
SHRI W G NAFDE	Gas Turbine Research Establishment, Bangalore
SHRI S K CHAKRAVARTI	Dunlop India Ltd (R&D), Mumbai
SHRI S CHATTERJEE (*Alternate*)	
SHRI K S VENKATARAMAN	Ministry of Defence (DRDL), Hyderabad
SHRI MILAN KUMAR BASU	Hindustan Aeronautics Ltd, Lucknow
SHRI D R ARORA (*Alternate*)	
SHRI S C SHRIMALI	Aeronautical Development Agency (ADA), Bangalore
SHRI A R GULATI, Director (Transport Engineering)	Director General, BIS (*Ex-officio Member*)

Member-Secretary

SHRI P P SINGH

Joint Director (Transport Engineering), BIS

Accessories, Fittings and Fasteners for Aircraft and Space Vehicles Subcommittee, TED 14 : 2

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This Indian Standard has been developed from Doc No TED 14 (096)

Amendments Issued Since Publication

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